



Changing the Culture of “Ding”: Education, Legislation and Research on Concussive Brain Injury in Youth Athletics

Claire D. Overturf & Donald C. Cooper^{1*}

Jake Snakenburg, a freshman football player from Grandview, Colorado, suffered a concussion during a practice in 2004. He was hit a second time during a game a week later and immediately collapsed. After being air lifted to a hospital, Jake passed away from a catastrophic brain injury caused by second impact syndrome (SIS). SIS occurs when a second traumatic brain injury (TBI) or concussion is suffered while the brain is still in a vulnerable state from a previous TBI. The Jake Snakenburg Act is a Colorado law that now seeks to protect young athletes and educate parents and coaches on the risks associated with concussion and TBI.

Since 2004, stories such as Jake's have raised public consciousness of sport related TBI however the culture that permeates youth and high school athletics today is a significant obstacle in the struggle to raise awareness of the issue and improve the safety of our children. Education measures and return to play guidelines have been adopted by a majority of states, but as serious as brain injuries are, there remain large gaps in our understanding of the scope of the problem and efforts to educate are hindered by the competitive culture of sport, the perceived value of being “tough”, and the attitude that mTBIs are injuries that can just be shaken off. Estimates of the number of sport related TBIs that occur annually range from 1.6 million to nearly 3.8 million¹ and despite the high profile of the issue, data are sparse. The NFL has commissioned several studies regarding TBI and concussion, but that pool of professional athletes is small compared to the estimated 30 million children that participate in youth athletics in the U.S.² It may seem like hard-hitting professional football players would be at a higher risk for concussion and TBI, but studies have shown that the developing brains of children are especially vulnerable³, and while pro-players are surrounded by medical staff trained to diagnose TBI, most youth sports are presided over by volunteer parents with little or no education on the subject. Studies of sport related TBI at the professional and college levels are useful, but more needs to be done to identify and address the specific TBI and concussion issues faced at the youth level. Efforts to affect the culture of these sports are especially important because in order to protect our youth athletes we will have to fundamentally change how concussions are viewed by the athletes themselves, parents, and coaches.

Symptoms of Concussion

Headaches
Dizziness
Excessive fatigue
Concentration problems
Memory Problems
Irritability
Balance problems
Vision change
Sleep disturbance

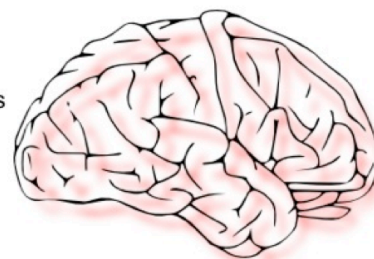


Fig. 1: Symptoms of Concussion/mTBI

Youth Concussions/mTBI on the Rise

The number of emergency department visits concerning sport related TBI in youth increased 57% from 2001 to 2009⁴ and while a fraction of that increase may be attributed to injuries that were once missed now being identified due to greater general awareness, the fact remains that there are nearly 200,000 children every year who suffer sport related concussion or other TBI serious enough to prompt a visit to the ED.⁴ 40% of sports related concussions involve children between the ages of 8 and 13, and in this group the rate of concussion doubled between 1997 and 2007.⁵ The risk of concussion is highest in football and there are nearly 67,000 diagnosed concussions in high school football every year.⁶ In other sports that males and females play, such as basketball, girls seem to be at a higher risk. In high schools, concussions account for 15% of all sports related injuries resulting in at least one day of play lost.⁷ The risk of a suffering a concussion when participating in a contact sport may be as high as 20% per season. In both girls' and boys' soccer and basketball 20% of the concussions were repeat concussions.⁸ These statistics just further illustrate the gravity of the problem of sport related concussions.

Symptoms of Concussion/mTBI

Whether concussions/mTBI come from the excessive g-forces of a head to head collision in athletics or a blast from an explosion in a military operation they share common symptoms (Fig 1).

What Can be Done about Youth Concussion/mTBI?

The problem of youth concussion and TBI is multifaceted and complex. There are numerous issues that must be addressed in

1. Department of Psychology and Neuroscience, Institute for Behavioral Genetics, University of Colorado, Boulder, CO 80303 USA

* Correspondence should be sent to D.Cooper@colorado.edu

order to make meaningful progress towards a solution. Here we describe three branches vital for change in the concussion/mTBI culture as well as the work currently being done in each category and future goals.

Education/Awareness

Education will continue to play an important role as we address the issue of sport related concussion and TBI. It is not enough to simply identify the risks associated with these injuries; we must ensure that children, parents, coaches, educators and medical professionals all have an appropriate understanding of the issue and the important roles each party plays in the effort to keep our kids safe from concussion and TBI. While youth athletes can generally recognize an injury because it causes pain and hinders performance, symptoms of a concussion or TBI often don't involve pain and in many cases may appear to subside very quickly. To a young athlete naïve of the signs of concussion or their seriousness, feeling "funny" after a hard hit may not seem a valid reason to sit out a play and take the time to inform a coach. Even when players are cooperating, it may be difficult to recognize a TBI or concussion. Advocates of concussion and TBI safety face a huge challenge in that the culture of sport has previously regarded concussions and mTBIs as injuries that players can just "shake off". In 2010 after suffering a concussion Pittsburgh Steelers receiver Hines Ward criticized the team's medical staff for removing him from the game. "It's football. You get your bell rung. It's my body. I feel like if I want to go back out there, I feel like I should have the right." There must be fundamental change in the way concussions and TBIs are viewed and this change is only possible if we commit to providing comprehensive education at every level. The prevailing attitude in sports allows for such innocuous quips as "getting dinged" or having your "bell rung"; these sayings simply do not convey the true nature of the injury and making light of it does nothing but endanger children further and create an environment not conducive to accurate diagnosis and management. Culture change will be integral to the fight against concussion and TBI. Players, coaches, and parents must be made to understand that no matter the value we may have traditionally placed on an athlete's ability to "tough it out"—e.g. Kerri Strug performing a perfect vault and winning the gold medal for her team with a broken ankle—nobody wins when we belittle the severity of an injury such as a concussion.

Yet another area where education will prove imperative is within schools. For children with a concussion or TBI, the return to school means the return of headaches and fatigue. The cognitive stressors of schoolwork can often aggravate symptoms or drag out recovery times. Just as there are return to play guidelines, each youth athlete should have a plan for his or her return to school. One solution to ensure a quick and safe recovery is training brain injury specialists who understand concussion and mTBI and can assist students in schedule and workload modification, symptom management, and communication between parents, doctors, and teachers.

Here it is important to note that regardless of the audience, education for concussion/mTBI should have not only a low barrier to access, but should also be presented in a manner that is engaging and has an interactive component. Although most states now require some sort of concussion

information form, it's clear that a permission slip is not an effective educational tool. Utilizing online and mobile platforms in a way that allows for participation and discussion is just one possibility as we explore better ways to inform about concussion and mTBI.

Legislation/Regulation

Currently 31 states and the District of Columbia have enacted laws concerning youth concussion and TBI. Most laws are based on the Lystedt law of Washington state, which comprises of three main components: education, removal from play guidelines, and return to play guidelines. The education stipulation of most laws requires coaches of youth sports to undergo some form of concussion mTBI training as well as informing parents and athletes of the risk involved. This training is integral in the effort because guidelines for dealing with concussions will only be effective at protecting kids if everyone involved understands the implications such an injury. Play guidelines dictate that any player who suffers a concussion or suspected concussion be removed from play immediately and not be allowed to return until cleared by a medical professional. These laws are a great step to not only protect our children, but to raise awareness in general. In January 2012, NFL Commissioner Roger Goodell as well as NCAA President Mark Emmert sent 19 letters to the governors of states currently without any youth concussion laws urging them to support such legislation. The ultimate goal will be to have all 50 states covered under legislation such as the Lystedt Law in the next two years.

Research/Health monitoring

The third area that is critical for changing the "culture of concussion" is research. Despite billions of dollars in revenue that teams in the National Football League have accumulated there have been very few if any studies dedicated to gathering data on impact force, symptom severity or the long-term effects of repeated concussive mTBI. To address this issue more funded work needs to be directed at the professional and youth athletics level. Better symptom tracking and data gathering using mobile and Smartphone devices as well as innovative new brain imaging tools and diagnostic biomarkers will help us develop treatment and prevention strategies for concussive mTBI.

PROGRESS AND COLLABORATIONS

To see up-to-date progress or if you are interested in contributing to this project or want more information on concussion education/research visit www.neuro-cloud.net/nature-precedings/overturf

1. Daneshvar, D. H., et al Clin. Sports Med. 30, 1-17 (2011).
2. Metzl, J. D. Pediatrics 117, 1813 (2006).
3. Halstead, M. E., et al Pediatrics (2010).
4. Gilchrist, et al .morbidity and mortality weekly report 60, 1337.
5. Bakhos, L. L., et al Pediatrics 126, e550-6 (2010).
6. Talavage, T. M. et al. J. Neurotrauma (2010).
7. Meehan, W. P., et al. Am. J. Sports Med. 39, 2304-2310 (2011).
8. Lincoln, A. E. et al. Am. J. Sports Med. 39, 958-963 (2011).